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## PATENT ABSTRACTS OF JAPAN

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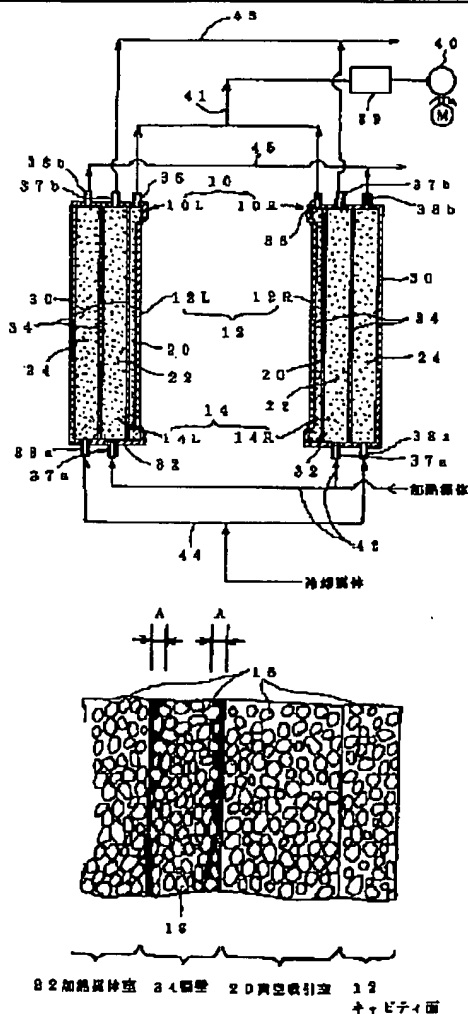
(74) Representative:

## (54) MOLD FOR MOLDING RESIN

(57) Abstract:

**PURPOSE:** To uniformly control the surface temp. of a mold cavity and to enhance product yield by forming a vacuum suction chamber and the partition chamber of heating and cooling medium introducing chambers in the axial direction of a mold by using porous sintered metal in a space chamber and packing the partition chamber with porous sintered metal.

**CONSTITUTION:** A mold 10 for molding a resin is equipped with a temp. control device and has a container shape consisting of a back plate 30 obtained by applying electroplating or flame spraying to the surface of a porous sintered metal 16 and a mold frame 32 shaping a mold 14 and a lid member forming a cavity surface 12 made of a porous sintered metal is fixed to provide a space chamber in the mold 14. The porous sintered metal 16 to which electroplating or flame spraying is applied is used in the space chamber to form the partition chambers of a vacuum suction chamber 20, a heating medium chamber 22 and a cooling medium introducing chamber 24 in the axial direction of the mold 14. The partition chambers are further packed with a porous sintered metal. By this constitution, the temp. distribution of the cavity surface 12 can be uniformized.



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**CLAIMS**

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[Claim(s)]

[Claim 1] To a thing of the shape of a container which consists of a metal mold frame which forms a back plate and metal mold which are a resin molding die equipped with a temperature control unit, and performed electrolytic plating or thermal spraying to the surface of a porosity sintered metal. Fix a lid which forms a cavity side made from a porosity sintered metal, and a space room is prepared in said metal mold. A resin molding die characterized by making it a configuration which loaded with a porous sintered metal into said cell while forming a cell of a vacuum suction room, a heating medium, and a cooling-medium induction room in said space room at shaft orientations of said metal mold using a porosity sintered metal which performed electrolytic plating or thermal spraying.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to a suitable resin molding die to raise the product yield while it relates to a low-pressure resin molding die or the low-pressure Breaux molding die, especially attains equalization of the temperature distribution of a cavity side.

[0002]

[Description of the Prior Art] After injecting parison, performing PURIBURO to the parison made saccate with the parison pinch and swelling slightly from a dice, he is trying to close metal mold on either side with mold clamp equipment by the conventional, for example, blow molding, method. If metal mold closes, while extracting the gas in a cavity coincidence or just before that, in parison, high-pressure blowing in is performed, a cavity is stuck, and cooling shaping is carried out with metal mold. After shaping, an aperture and a product are taken out and 1 cycle shaping completes metal mold.

[0003] By the way, although parison is stuck to a metal mold cavity and made into a predetermined configuration, metal mold is set as a temperature lower than parison temperature, and he is trying to usually keep this temperature constant among 1 cycle, by the conventional shaping method, in order to cool and fabricate the parison stuck to the cavity. For this reason, it is common to puncture metal mold with a drill etc., or to cast a copper pipe and a spiral tube inside metal mold, to carry out conduction of heat exchange data medium into this pipe, and to try to plan temperature control.

[0004]

[Problem(s) to be Solved by the Invention] However, although the heat exchange data-medium path was formed in the interior with the copper pipe etc. in the conventional metal mold, as a result of being unable to perform uniform temperature control of metal mold easily in the case of large-sized metal mold like the Breaux molding die and temperature distribution's arising from the entrance of heating or a cooling medium in the longitudinal direction of the other metal mold cavity side to an outlet, residual stress remained in the Breaux mold goods, the product curvature-came to be easy, and there was a problem that the product yield fell.

[0005] Paying attention to the above-mentioned conventional trouble, regardless of the configuration of a cavity, the uniform temperature control of metal mold is possible for this invention, and it aims at offering the resin molding die it enabled it to raise the product yield.

[0006]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, a resin molding die concerning this invention To a thing of the shape of a container which consists of a metal mold frame which forms a back plate and metal mold which are a resin molding die equipped with a temperature control unit, and performed electrolytic plating or thermal spraying to the surface of a porosity sintered metal Fix a lid which forms a cavity side made from a porosity sintered metal, and a space room is prepared in said metal mold. While forming a cell of a vacuum suction room, a heating medium, and a cooling-medium induction room in said space room at shaft orientations of said metal mold using a porosity sintered metal which performed electrolytic plating or thermal spraying, it was made a

configuration which loaded with a porous sintered metal into said cell.

[0007]

[Function] According to the above-mentioned configuration, with a porosity sintered metal, as compared with a conventional copper pipe and a conventional spiral tube, a heating area can increase several times, and efficiency of heat transfer can be raised. Moreover, since the porosity sintered metal used for the cavity side functions as a pore layer, it becomes a thermal break and can prevent conducting the heat from parison on the main part of metal mold. Furthermore, the product yield can be made high, heat capacity becoming small, being able to give heating and the cooling effect equally all over parison, and aiming at uniform heating and cooling of a cavity side, since the temperature-control effect is high and the porosity sintered metal is moreover arranged by the metal mold frame by loading with a porosity sintered metal with the 5-20 micrometers [ to which heating or the cooling-medium interior of a room may be made to carry out conduction of heating or the cooling medium, respectively ] continuous path.

[0008]

[Example] Below, the concrete example of the resin molding die concerning this invention is explained with reference to a drawing at details.

[0009] Drawing 1 thru/or drawing 3 are one example of the Breaux molding die concerning this invention, and drawing 1 is [ the cross section of the Breaux molding die and drawing 3 of heating and the cooling system of the Breaux molding die, and drawing 2 ] the important section expanded sectional views of the Breaux molding die.

[0010] The block diagram of the Breaux molding die 10 concerning an example is shown in drawing 1 and drawing 2 . While this Breaux molding die 10 is constituted by the Breaux molding dice 10R and 10L of a left Uichi pair, he is trying to fabricate the blow molding article which is in agreement with the sealing cavity formed of mold doubling by putting the parison which formed the cavity side 12 (12R, 12L) in the mold mating face, and was injected from the dice which is not illustrated, and performing an air blow to the interior of parison.

[0011]

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**TECHNICAL FIELD**

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[Industrial Application] This invention relates to a suitable resin molding die to raise the product yield while it relates to a low-pressure resin molding die or the low-pressure Breux molding die, especially attains equalization of the temperature distribution of a cavity side.

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**PRIOR ART**

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[Description of the Prior Art] After injecting parison, performing PURIBURO to the parison made saccate with the parison pinch and swelling slightly from a dice, he is trying to close metal mold on either side with mold clamp equipment by the conventional, for example, blow molding, method. If metal mold closes, while extracting the gas in a cavity coincidence or just before that, in parison, high-pressure blowing in is performed, a cavity is stuck, and cooling shaping is carried out with metal mold. After shaping, an aperture and a product are taken out and 1 cycle shaping completes metal mold. [0003] By the way, although parison is stuck to a metal mold cavity and made into a predetermined configuration, metal mold is set as a temperature lower than parison temperature, and he is trying to usually keep this temperature constant among 1 cycle, by the conventional shaping method, in order to cool and fabricate the parison stuck to the cavity. For this reason, it is common to puncture metal mold with a drill etc., or to cast a copper pipe and a spiral tube inside metal mold, to carry out conduction of heat exchange data medium into this pipe, and to try to plan temperature control.

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**EFFECT OF THE INVENTION**

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[Effect of the Invention] At this invention, it is so that clearly also from having explained above, To the thing of the shape of a container which consists of a metal mold frame which forms the back plate and metal mold which are a resin molding die equipped with the temperature control unit, and performed electrolytic plating or thermal spraying to the surface of a porosity sintered metal Fix the lid which forms the cavity side made from a porosity sintered metal, and a space room is prepared in said metal mold. While forming the cell of a vacuum suction room, a heating medium, and a cooling-medium induction room in said space room at the shaft orientations of said metal mold using the porosity sintered metal which performed electrolytic plating or thermal spraying Since the temperature distribution of a cavity side can be made into homogeneity by having made it the configuration which loaded with the porous sintered metal into said cell, While a blow molding article with the high dimensional accuracy which the internal stress by heating and cooling at the time of blow molding does not remain in a blow molding article, and does not have torsion etc. is obtained, the product yield improves sharply.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] However, although the heat exchange data-medium path was formed in the interior with the copper pipe etc. in the conventional metal mold, as a result of being unable to perform uniform temperature control of metal mold easily in the case of large-sized metal mold like the Breaux molding die and temperature distribution's arising from the entrance of heating or a cooling medium in the longitudinal direction of the other metal mold cavity side to an outlet, residual stress remained in the blow molding article, the product curvature-came to be easy, and there was a problem that the product yield fell.

[0005] Paying attention to the above-mentioned conventional trouble, regardless of the configuration of a cavity, the uniform temperature control of metal mold is possible for this invention, and it aims at offering the resin molding die it enabled it to raise the product yield.

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**MEANS**

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[Means for Solving the Problem] In order to attain the above-mentioned purpose, a resin molding die concerning this invention To a thing of the shape of a container which consists of a metal mold frame which forms a back plate and metal mold which are a resin molding die equipped with a temperature control unit, and performed electrolytic plating or thermal spraying to the surface of a porosity sintered metal Fix a lid which forms a cavity side made from a porosity sintered metal, and a space room is prepared in said metal mold. While forming a cell of a vacuum suction room, a heating medium, and a cooling-medium induction room in said space room at shaft orientations of said metal mold using a porosity sintered metal which performed electrolytic plating or thermal spraying, it was made a configuration which loaded with a porous sintered metal into said cell.

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**OPERATION**

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[Function] According to the above-mentioned configuration, with a porosity sintered metal, as compared with a conventional copper pipe and a conventional spiral tube, a heating area can increase several times, and efficiency of heat transfer can be raised. Moreover, since the porosity sintered metal used for the cavity side functions as a pore layer, it becomes a thermal break and can prevent conducting the heat from parison on the main part of metal mold. Furthermore, the product yield can be made high, heat capacity becoming small, being able to give heating and the cooling effect equally all over parison, and aiming at uniform heating and cooling of a cavity side, since the temperature-control effect is high and the porosity sintered metal is moreover arranged by the metal mold frame by loading with a porosity sintered metal with the 5-20 micrometers [ to which heating or the cooling-medium interior of a room may be made to carry out conduction of heating or the cooling medium, respectively ] continuous path.

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## EXAMPLE

[Example] Below, the concrete example of the resin molding die concerning this invention is explained with reference to a drawing at details.

[0009] Drawing 1 thru/or drawing 3 are one example of the Breaux molding die concerning this invention, and drawing 1 is [ the cross section of the Breaux molding die and drawing 3 of heating and the cooling system of the Breaux molding die, and drawing 2 ] the important section expanded sectional views of the Breaux molding die.

[0010] The block diagram of the Breaux molding die 10 concerning an example is shown in drawing 1 and drawing 2 . While this Breaux molding die 10 is constituted by the Breaux molding dice 10R and 10L of a left Uichi pair, he is trying to fabricate the blow molding article which is in agreement with the sealing cavity formed of mold doubling by putting the parison which formed the cavity side 12 (12R, 12L) in the mold mating face, and was injected from the dice which is not illustrated, and performing an air blow to the interior of parison.

[0011] The porosity sintered metal 16 is used for the septum 34 for the main part 14 (14R, 14L) of metal mold in such a Breaux molding die 10 to carry out cell formation of the space section formed in the back plate 30, the metal mold frame 32 which surrounds the flank of the main part 14 of metal mold, the cavity side 12 as a lid, and the main part 14 of metal mold.

[0012] As especially shown in drawing 3 , if said back plate 30, the metal mold frame 32, and a septum 34 perform electrolytic plating or thermal spraying, such as aluminum, to the surface of the porosity sintered metal 16 as a base material, a composite field (this drawing A) portion will be formed of this.

[0013] The porosity sintered metal 16 which forms the main part 14 of metal mold has sufficient thermal resistance, in order to carry out resin shaping, a powder metal with a comparatively large grain size is formed with the usual sintering process, for example, using sintered-metal powder, such as a copper system, an iron system, and an aluminum system, it sinters and the pore 18 by which many followed the interior by sintering is formed.

[0014] These are formed by the sintering process called "powder metallurgy", and have solid phase sintering which mainly uses the surface diffusion in the contact surface of the solid-states of metal powder, and liquid phase sintering which fuses a part of component of raw material powder, and obtains association between molecules. Thus, as the sintered metal which has the three-dimensional continuous opening inside is called a "metal filter" and mentioned above, different metal raw material powder is mixed, it is sintered, and alloys, such as Cu-Sn, Fe-Cr-nickel, Cu-Sn-Pb, Fe-C, Fe-Cu, Fe-C-Cu, and aluminum-Cu, are constituted in addition to a pure metal. The production process of powder-metallurgy processing of manufacturing a sintered metal is carried out in order of manufacture of raw material powder, combination and mixing of powder, compacting, sintering, and after treatment, and has easy machining, an improvement of a surface state, correction of a size, etc. as after treatment.

[0015] In this example, it has composition which carried out partition formation of the space section which formed the inside of the main part 14 of metal mold in the shape of a box as shown in drawing 1 and drawing 2 by said septum 34 at the vacuum suction room 20, the heating-medium room 22, and the cooling-medium room 24 at the shaft orientations of the main part 14 of metal mold.

[0016] Furthermore, while being loaded with the large porosity sintered metal 16 of pore 18 path into said vacuum suction room 20, the heating-medium room 22, and the cooling-medium room 24 and having much pores 18 with a diameter of 5-20 micrometers in this porosity sintered-metal 16 interior, each porous comrade can form the continuous fluid channel, and gaseous substances, such as cold energy data medium, can circulate.

[0017] Surface treatment of the cavity side 12 made from porosity sintered-metal 16 which constitutes the lid of the main part 14 (14R, 14L) of metal mold is carried out with shot brass, shot peening, etc. so that the marks of the pore 18 of the porosity sintered metal 16 may not be imprinted by the parison surface, when parison (with no illustration) which hung from the dice (with no illustration) is \*\*\*\*(ed), and finishing is performed in the shape of a mirror plane.

[0018]

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] They are heating and the cooling system of the Breaux molding die concerning the example of this invention.

[Drawing 2] It is the cross section of the Breaux molding die concerning the example of this invention.

[Drawing 3] It is the important section expanded sectional view of the Breaux molding die concerning the example of this invention.

[Description of Notations]

10 (10R, 10L) Breaux molding die

12 (12R, 12L) Cavity side

14 (14R, 14L) Main part of metal mold

16 Porosity Sintered Metal

18 Pore

20 Vacuum Suction Room

22 Heating-Medium Room

24 Cooling-Medium Room

30 Back Plate

32 Metal Mold Frame

34 Septum

36 Vacuum Suction Hole

37 (37a, 37b) Heating-medium circulation hole

38 (38a, 38b) Cooling-medium circulation hole

39 Vacuum Tank

40 Vacuum Pump

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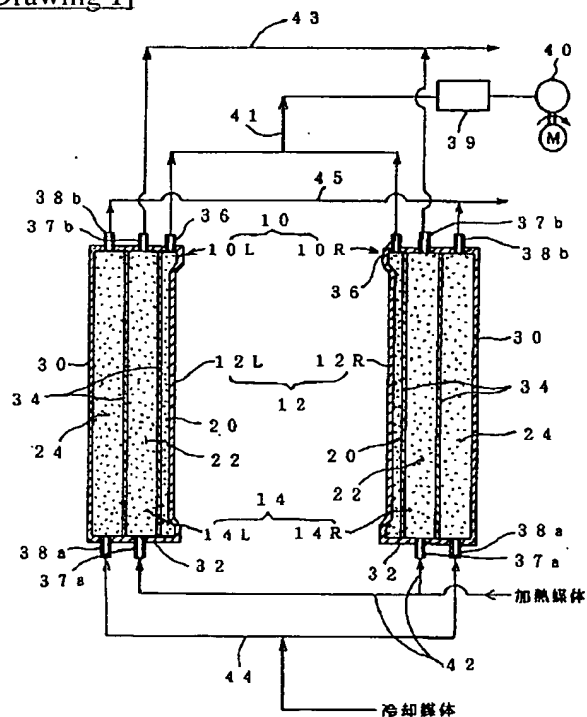
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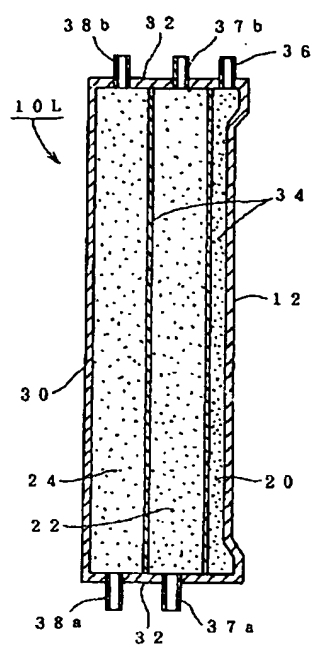
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## DRAWINGS

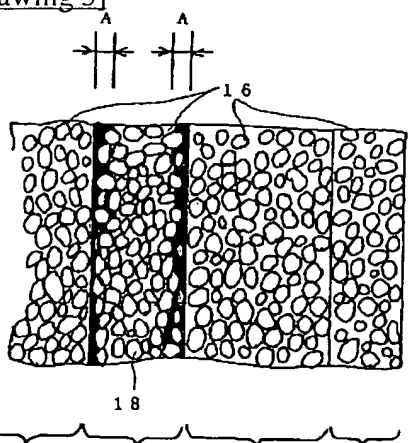
[Drawing 1]



[Drawing 2]



[Drawing 3]



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キャビティ面

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